

## CLAIMS

We claim:

1. A method of geophysical exploration of a subsurface region of interest, comprising:  
utilizing an unsupervised learning network to organize seismic data representing a subsurface region of interest;  
correlating a portion of said organized seismic data with lithological data from a well bore located in said subsurface region of interest; and  
applying said correlation to said seismic data to estimate lithology in said subsurface region of interest.
2. The method of claim 1 wherein said unsupervised learning network is a self organizing feature map.
3. The method of claim 1 wherein said unsupervised learning network is a Kohonen network.
4. A method of geophysical exploration of a subsurface region of interest, comprising:  
applying a plurality of seismic data attributes for measurement location from a seismic data set from a subsurface region of interest to a Kohonen network to organize said seismic data set into a plurality of seismic Kohonen classes;  
selecting a subset of said organized seismic data set representative of the earth's subsurface in the vicinity of a well bore penetrating said subsurface region of interest;  
correlating Kohonen classes of said subset of said organized seismic data set with classes of lithological data from said well bore to generate a correlation between Kohonen classes and lithological classes; and  
applying said correlation to said seismic data set to estimate lithology of said measurement locations.



1 10. A device which is readable by a digital computer having instructions defining the  
2 following process and instructions to the computer to perform said process:  
3 utilizing an unsupervised learning network to organize seismic data representing a  
4 subsurface region of interest;  
5 correlating a portion of said organized seismic data with lithological data from a  
6 well bore located in said subsurface region of interest; and  
7 applying said correlation to said seismic data to estimate lithology in said subsurface  
8 region of interest.

1 11. A device which is readable by a digital computer having instructions defining the  
2 following process and instructions to the computer to perform said process:  
3 applying a plurality of seismic data attributes for measurement location from a  
4 seismic data set from a subsurface region of interest to a Kohonen network to organize said  
5 seismic data set into a plurality of seismic Kohonen classes;  
6 selecting a subset of said organized seismic data set representative of the earth's  
7 subsurface in the vicinity of a well bore penetrating said subsurface region of interest;  
8 correlating Kohonen classes of said subset of said organized seismic data set with  
9 classes of lithological data from said well bore to generate a correlation between Kohonen  
10 classes and lithological classes; and  
11 applying said correlation to said seismic data set to estimate lithology of said  
12 measurement locations.

1 12. A device which is readable by a digital computer having instructions defining the  
2 following process and instructions to the computer to perform said process:  
3 applying a plurality of lithology values for measurement location from a well bore  
4 penetrating a subsurface region of interest to a Kohonen neural network to organize said  
5 lithology values into a plurality of lithology Kohonen classes;  
6 utilizing said lithology Kohonen classes to establish ranges of a lithology value;

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7           applying a plurality of seismic data attributes for measurement location from a  
8 seismic data set from said subsurface region of interest to a Kohonen network to organize  
9 said seismic data set into a plurality of seismic Kohonen classes;  
10           selecting a subset of said organized seismic data set representative of the earth's  
11 surface in the vicinity of said well bore penetrating said subsurface region of interest;  
12           correlating Kohonen classes of said subset of said organized seismic data set with  
13 classes of lithological data from said well bore to generate a correlation between Kohonen  
14 classes and lithological classes, wherein said ranges of a lithology value are utilized in  
15 establishing boundaries of said lithology classes; and  
16           applying said correlation to said seismic data set to estimate lithology of said  
17 measurement locations from said subsurface region of interest.